APPENDIX D:

NO_2 Near-Road Monitoring Station Siting Requirements and Selection Process for the Bakersfield Core Based Statistical Area

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1. Introduction

In 2010, the U.S. Environmental Protection Agency (EPA) established a new 1-hour standard and new minimum monitoring requirements for nitrogen dioxide (NO_2). Additionally, EPA promulgated new NO_2 monitoring network design requirements which consist of three distinct NO_2 air monitoring networks. The first network is the near-road monitoring network which is aimed at capturing the higher NO_2 concentrations that occur near roadways. The second network is the area-wide monitoring network which will represent NO_2 concentrations characteristic of large neighborhood or urban areas. The third network, which is called the Regional Administrator Required Monitoring Network, requires Regional Administrators to work with states to site a network of 40 NO_2 monitors throughout the nation in locations aimed at protecting susceptible and vulnerable communities.

The monitoring requirements for the first two monitoring networks mentioned above for the new NO_2 1-hour standard are based upon the population of Core Based Statistical Areas (CBSAs) as well as the annual average daily traffic (AADT) counts. The intent of the NO_2 near-road network is placing the monitoring stations near major roads where maximum hourly NO_2 concentrations are expected. As noted in Section 4.3 of Appendix D of 40 CFR Part 58, one microscale near-road NO_2 monitoring station is required in each CBSA with a population of 500,000 or more. Data such as traffic volumes, fleet mix, roadway design, traffic congestion patterns, and characteristics such as local terrain or topography, and meteorology are among the criteria that must be considered when determining areas which have the highest NO_2 concentrations. Additionally, population exposure, near-road siting criteria, safety, surrounding land use, and other factors are also considered during the location selection process. NO_2 monitors that are required under this new standard are to be operational by January 1, 2013; however EPA recently released a proposed rule that will move this date to January 1, 2017. To assist agencies with the siting selection process, EPA provided the Near-Road NO_2 Monitoring Technical Assistance Document (TAD) which outlines recommendations and ideas on how to successfully meet the revised NO_2 near-road monitoring requirements[1].

EPA requires air monitoring agencies to submit a report which describes the site selection process for each NO_2 near-road monitoring station that will be established. The San Joaquin Valley Air Pollution District (District) is required to install four near-road air monitoring stations, one in each of the following CBSAs: Stockton, Modesto, Fresno, and Bakersfield. Accordingly, a report of the site selection process will be submitted by the District for each of the aforementioned stations.

With considerable assistance provided by the California Air Resources Board (CARB), the District carried out a detailed process of selecting a site for a near-road monitoring

[1] Near-Road NO_2 Monitoring Technical Assistance Document (TAD) – A document that provides state and local air agencies with recommendations and ideas on how to successfully implement near-road NO2 monitors in order to meet the NO_2 minimum monitoring requirements that were revised in 2010. http://www.epa.gov/ttnamti1/files/nearroad/NearRoadTAD.pdf

station in the Bakersfield CBSA. This report describes the site selection process conducted by the District and CARB for the purpose of establishing a new NO_2 near-road monitoring station.

2. Site Selection Process

The District conducted a site selection process that involved assistance from the CARB in gathering traffic count data, and determining candidate road segments and the positive and negative attributes of each. Road design, and wind direction associated with each road segment were also considered during the process. Once the acceptable land parcels were decided upon, a lease was negotiated between the District and one of the property owners and the final site selection was made. In addition to following the guidance provided in the TAD, the District also considered PM2.5 so the site could potentially accommodate a PM2.5 monitor in the future.

2.1 Traffic Count Data

In order to determine the road segments that theoretically have the highest NO_2 concentrations, CARB and the District assessed all available traffic count data available from the California Department of Transportation (Caltrans) for Kern County. The data included AADT, Fleet mix, FE-AADT, and congestion data. Following the guidance found in the TAD, the District and CARB used FE-AADT to determine and rank the road segments.

2.1.1 AADT

Traffic counts represent AADT which is the total traffic volume for one year divided by the number of days in the year. AADT usually depicts the traffic volume along a given road segment. All traffic count figures listed include traffic in both directions. Ahead AADT typically refers to traffic north and east of a traffic count location, and Back AADT typically refers to traffic south and west of a traffic location. To avoid overlapping data, the Ahead AADT was used in the District’s site selection process.

Caltrans typically collects traffic counts on freeways. The majority of continuous traffic count sampling is conducted by moving the electronic counting instruments from location to location throughout the state. Traffic counts are adjusted estimates of AADT which compensate for seasonal influence, weekly variation, and other variables.

2.1.2 AADTT

Truck traffic is classified by the number of axles trucks have. For example, 1½ -ton trucks with dual rear tires are included in the two-axle class but pickups and vans with only four tires are not. Annual average daily truck traffic (AADTT) is the total truck traffic volume for one year divided by the number of days in the year. Continuous truck count sampling consists of vehicle classification counts that are conducted throughout California. This program includes partial day and 24-hour counts on high volume, urban freeways, and 7-day counts on low volume, rural freeways. Truck counts are adjusted estimates of AADTT which compensate for seasonal influence, weekly variation, and other variables.

2.1.3 Fleet Mix

Fleet mix pertains to a specific count or percentage of the total volume of traffic and differentiates between light-duty (LD) vehicles and heavy-duty (HD) vehicles. Differences between LD and HD vehicles include the type of fuel they run on (gasoline vs. diesel), and the vehicle's weight, length, or number of axles. NO_2 emissions vary for all vehicles depending on vehicle type; load, speed, and freeway grade, however, diesel fueled HD vehicles typically emit far higher amounts of NO_2 than do gasoline fueled LD vehicles. Fleet mix is important in determining where the emission differences occur.

2.1.4 Fleet Equivalent AADT

FE-AADT is a metric[2] that accounts for total traffic volume and fleet mix in order to compare road segments, especially when the amount of total traffic volume and HD volume on those road segments varies. FE-AADT gives a better indication of estimated NO2 emissions than does AADT. The FE-AADT values shown in Table 1 below were determined using Ahead AADT and AADTT in the equation below:

$$\text{FE-AADT} = (\text{Ahead AADT} - \text{AADTT}) + (\text{AADTT}*10)$$

This equation gives truck traffic 10 times the weight of non-truck traffic in determining rank because the NO_2 emissions are approximately 10 times as great as non-truck traffic. The segments with the highest levels of NO_2 should be those with the greatest truck traffic.

2.1.5 Postmile

Caltrans has identified Postmile values as breakpoints on Freeways that usually increase from South to North or West to East depending on the direction the route follows within the county. Postmile values increase from the beginning of the route to the next county line and then start over. The total AADT values shown in the tables below apply to the freeway immediately ahead of the Postmile.

[2] For more information on the equation that defines FE-AADT, go to http://www.epa.gov/ttnamti1/files/nearroad/NearRoadTAD.pdf.

2.1.6 Traffic Congestion

Traffic congestion can lead to stop-and-go traffic conditions and per-vehicle emissions may increase as a result. A notable and constant reduction in speed between two points on a freeway is defined as a bottleneck. The congestion values shown the tables below are annual vehicle hourly delay (AVHD) in thousand hours and represent the sum of the delay from the morning and evening peak periods and from the midday period.

2.2 Physical Characteristics of Near-Road Sites

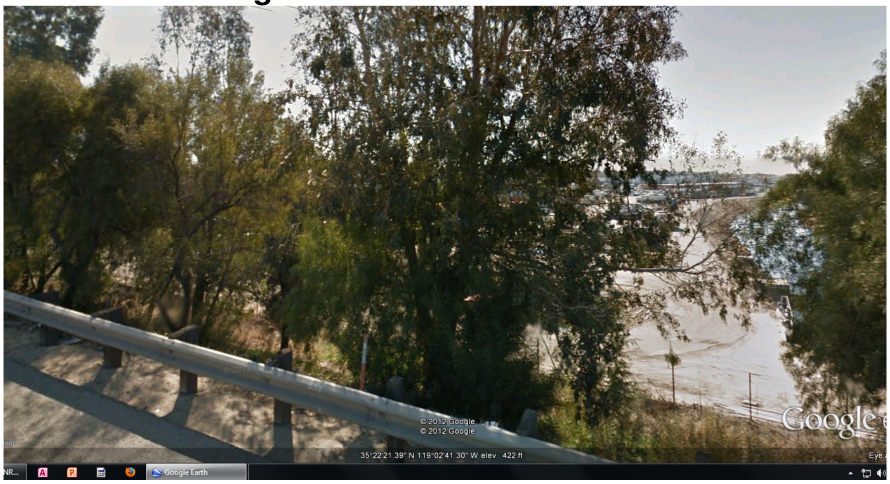
The physical characteristics of candidate road segments must be considered in order to determine which segments are adequate for near-road monitor placement. The characteristics to be assessed and accounted for include roadway design, roadside structures and vegetation, terrain, and meteorology.

2.2.1 Roadway design or configuration and clear zones

Road design or configuration is important in determining acceptable locations for near-road monitors because it can impact the dispersion and transport of pollutants. Road designs can be characterized as above-grade, below-grade, or at-grade. Additionally, road designs that contain features such as interchanges and toll plazas can influence vehicle acceleration and deceleration rates which in turn affect pollutant concentrations and plumes.

Above-grade or elevated road configurations can be open or have solid fill material beneath them (see Figure 1). Roads that are open underneath are subject to wind from all directions, increased dispersion, turbulence, and dilution of the air as it flows over and under the road. These affects can cause pollutant concentrations to be lower downwind of the elevated roadway. Roads that are over solid fill material can have winds normal with the road and forces that keep the traffic plume near at the surface while others can cause the plume to loft above the ground when it meets the vertical filled material or wall beneath.

Figure 1: Above Grade Road



Roads that are configured below-grade can have vertical or sloped walls that facilitate the funneling of air parallel to the road (see Figure 2). As the air streams through the corridor it can cause pollutant plumes to loft and be carried away as the air flows through, up, and out of the below-grade roadway.

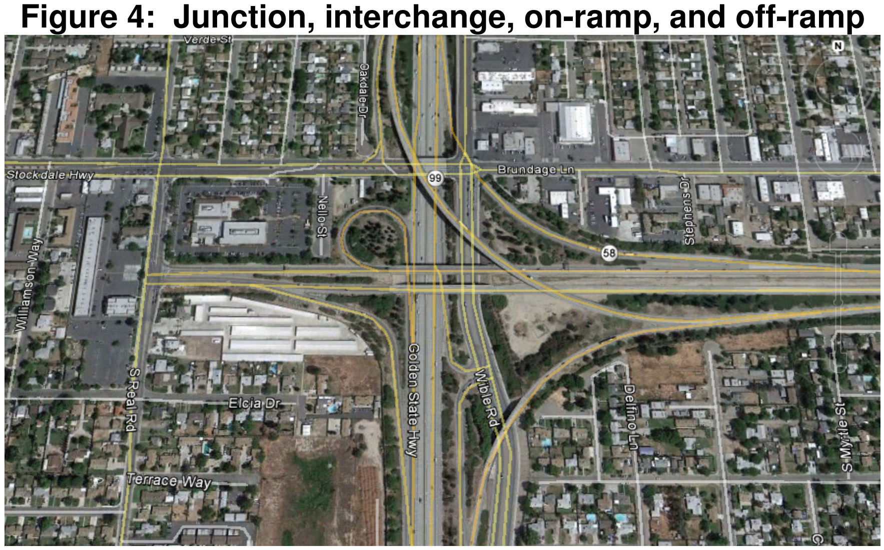
Figure 2: Below grade with up-slope

Roadways that are generally at the same elevation as the immediate surrounding terrain are referred to as at-grade roadways (see Figure 3). Other than structures or obstacles near the roadside, at-grade roadways pose the least amount of impact on pollutant dispersion. As stated in the TAD, at-grade or near at-grade roads are the most desirable road configurations for siting near-road monitors.

Figure 3: At grade roadway

As stated above, EPA requires that NO_2 near-road monitoring stations be placed in areas representative of high NO_2 levels. According to the TAD, road areas that go uphill or downhill, and roads that contain on-ramps and off-ramps, interchanges, or unique features such as toll plazas, and tunnel entrances and exits should not be considered for NO_2 near-road monitor placement because they are designed for rapid vehicle accelerations and decelerations (see examples in Figure 4). These areas and road designs do not produce representative NO_2 concentrations. The most suitable place to locate an NO_2 near-road monitoring station is one that is at grade with immediate flat surrounding terrain.

Figure 4: Junction, interchange, on-ramp, and off-ramp



Clear zones denote roadside areas that are available to drivers who need to pull over and stop safely or regain control if a vehicle leaves the road. Such zones extend from the road's outside traffic edge to an obstacle further off the road. The roadway's traffic volume, design speeds, and the slope of the terrain adjacent to and beneath the roadway are used to determine the width of the clear zone. Near-road monitoring stations are placed outside of clear zones.

2.2.2 Roadside structures and vegetation

Roadside structures such as sound walls or noise barriers can affect dispersion by blocking it or causing turbulence which can mix pollutants. Roadside structures can channel pollutants downwind and inhibit or reduce normal dispersion along the roadway. Vegetation can also affect pollutant transport and dispersion by mixing and diluting air as it blows through the branches and leaves of trees, and by blocking wind and slowing dispersion down. Additionally, pollutant concentrations in traffic plumes can decrease when particulate pollutants get deposited onto the surfaces of branches and leaves. Locations that are void of roadside structures and vegetation are therefore more acceptable for near-road monitor placement.

2.2.3 Terrain

Local terrain can affect dispersion and pollutant transport so it is important to have a good understanding of the large scale terrain features that characterize the air basin when considering locations for near-road monitor placement. For example, valleys may be more susceptible to high NO_2 concentrations because the surrounding terrain and temperature inversions tend to inhibit dispersion whereas open terrain areas allow for better air flow which can aid in lower pollutant concentrations.

2.2.4 Meteorology

The TAD states that evaluating historical meteorological data can be helpful in determining locations that may be directly impacted by traffic emissions from particular road segments due to local winds. Understanding the local meteorology can also indicate which side of a road segment may be more impacted by the traffic emissions. Research studies have shown that locations very close to the roadway on the downwind side of a given road segment can adequately capture peak pollutant concentrations.

2.3 Spatial scales and population exposure

40 CFR Part 58 Appendix D requires that the spatial scale of a NO_2 near-road air monitoring site be classed as a microscale site. Microscale sites measure peak concentrations in an area with of a radius 100 meters. Concentrations decrease significantly as distance increases outside of this area. This being the case, EPA requires near-road monitoring stations to be placed as close as practicable but no further than 50 meters from the target road segment. Additionally, EPA requires that the sampling inlet be within 2 to 7 meters from the road's surface.

As specified in 40 CFR Part 58 Appendix D, Section 4.3.2(a)(1), state and local air monitoring agencies shall consider the potential for population exposure when making their final near-road monitoring site selections when there are multiple acceptable sites in the same ranked segment.

2.4 Safety

As specified in the TAD, NO_2 near-road monitoring stations must be safely sited for motorists traveling the roadway and for the monitoring station operators. The sites are required to be safely and legally accessible to station operators and pose no safety hazards to drivers as well as people walking or living nearby. In addition, some sites will require the installation of permanent safety barriers, such as guardrails.

3. Site Selections for Bakersfield CBSA

3.1 Introduction

As stated in Section 2.0 above, the District started with traffic count data to select the freeway segments that were to be considered for a site. Meteorology, terrain, road structures, parcels with locations acceptable for building a site on, and landowner willingness to host a site on their property all played a role determining site selection. Since the segments were nearly continuous the District looked at them as a whole, focusing on finding acceptable locations. It quickly became apparent that the highest ranked segments in the urban core did not have any available land for constructing a site. These segments in central Bakersfield were typically above or below grade with sound walls which prevented placement of the site close enough to the edge of the freeway to capture peak values. In fact, the District found that there are only a few locations along the top ten segments that could meet all of EPA's siting criteria.

At this juncture, the District decided to contact all landowners of parcels with acceptable locations in the top ten segments and prioritize working with the landowners who responded positively within the highest ranked segments before moving further down the list.

The District process in locating a NO_2 near-road site can be summed as follows:

- Rank all road segments
- Determine the top 10 segments
- Find locations were a site can be built (acceptable locations or parcels)
    - Take into account meteorology, structures, obstacles, grade, and other criteria.
    - Take into account near-road exposure.
- Contact property owners by sending a letter
- Contact those property owners that are willing to work with us starting with those in the highest ranked segments

- Negotiate a lease with a willing property owner in the highest ranked segment
- Present site selection to the Governing Board for approval, and include the opportunity for public comments.

3.2 Traffic Count Data

Traffic count data determined which road segments would likely have the highest NO_2 concentrations in the Bakersfield CBSA. Because truck traffic accounts for the highest NO_2 emissions, the road segments were ranked by Fleet Equivalent Annual Average Truck Traffic (FE-AADT) counts. Areas that did not have recent truck traffic counts had to be estimated.

While the percentage of statewide annual vehicle hours of delay caused by traffic congestion is far less in the San Joaquin Valley than in other areas of the state, the District included traffic congestion with the traffic count data as per the requirements outlined in the TAD. Caltrans District 6, which includes the Bakersfield CBSA, has less than 2% of the statewide annual vehicle hours of delay due to traffic congestion in the entire district. The highest ranking bottleneck locations where freeway speed dropped and remained below 60 mph are shown in Table 1 in below. Because so little traffic congestion occurs in the Bakersfield CBSA, congestion did not factor into site selection.

3.2.1 Road Segment Ranking

After the traffic data was examined, each road segment was ranked by FE-AADT from the highest traffic count to the lowest for the CBSA. The list was narrowed to the top 30 road segments (see Appendix A) then reduced to the top 10 segments (see Table 1 below). District staff surveyed the areas within each segment, and identified which locations could support a near-road monitoring station.

Table 1: Kern County Top Road Segments by Fleet Equivalent AADT[4]

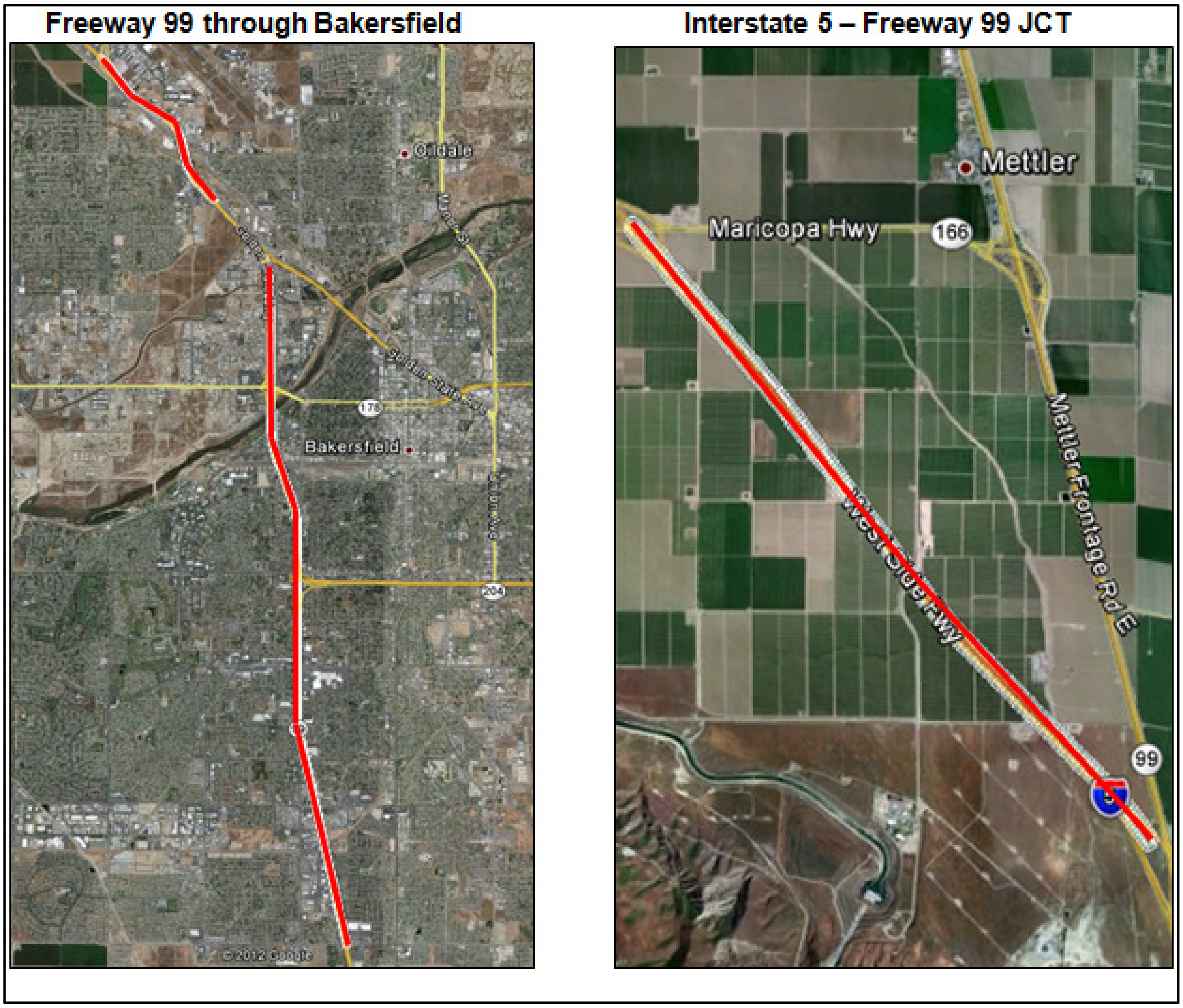
Route	Postmile[5]	Description	Ahead AADT[1]	AADT Rank	AADTT	AADTT Rank	Congestion[2]	FE AADT[6]	FE Rank
99	24.599	BAKERSFIELD, CALIFORNIA AVE	132,000	2	28,188	1		385,692	1
99	22.604	BAKERSFIELD, MING AVE	133,000	1	27,720	2	1	382,480	2
99	23.514	JCT. RTE. 58 EAST	129,000	3	23,400	3		339,600	3
99	21.082	BAKERSFIELD, WHITE LANE	114,500	4	17,500	5		272,000	4
99	25.654	JCT. RTE. 58 W, JCT. RTE. 178 E	102,500	5	18,300	4		267,200	5
99	26.776	BUCK OWENS BLVD	102,500	6	15,904	8		245,636	6
99	19.541	PANAMA LANE	92,600	8	16,240	7		238,760	7
5	15.858[3]	JCT. RTE. 99 NORTH	72,000	11	17,410	6		228,690	8
99	28.556	OIL JUNCTION	78,000	9	14,960	9		212,640	9
99	27.866	OLIVE DRIVE	74,000	10	13,783	11	2	198,047	10

[1] The Total AADT numbers shown apply to the freeway immediately ahead of the postmile.
[2] Congestion data is in annual vehicle delay in thousand hours. Caltrans District 6 (which includes Kern County) has less 2% of the statewide annual vehicle hours of delay.
[3] Postmile 15.858 – Data for AADT was double counting the adjacent road segment. Caltrans has determined that the data is erroneous for this location and requested that the District use 2009 data. The annual traffic volume data shows that state freeway traffic decreased 0.2% in 2010 from 2009.
[4] The Annual Average Daily Traffic (AADT) is defined as the total volume for the year divided by 365 days. Very few locations in California are actually counted continuously. Traffic Counting is generally performed by electronic counting instruments that are moved from location to location throughout the state in a program of continuous traffic count sampling. The resulting counts are adjusted to an estimate of annual average daily traffic by compensating for seasonal influence, weekly variation and other variables which may be present. All traffic volume figures that are listed include traffic in both directions.
[5] Postmile – Each breakpoint is identified by the postmile value corresponding to that point on the freeway. The postmile values increase from the beginning of a route within a county to the next county line. The postmile values start over again at each county line. Postmile values usually increase from South to North or West to East depending upon the general direction the route follows within the state.
[6] The equation FE AADT = (Ahead AADT-AADTT)+(AADTT*10) is defined in the TAD: http://www.epa.gov/ttnamti1/files/nearroad/NearRoadTAD.pdf.

3.2.2 The top 10 road segments

With the exception of the road segment located on Interstate 5 from the Interstate 5/Freeway 166 interchange to the Interstate 5/Freeway 99 interchange, the rest of the top 10 road segments are located along Freeway 99 through Bakersfield. The red lines in Figures 5a and 5b below demark the general location of the top 10 road segments. Gaps between the red lines along Freeway 99 depict locations of road segments that were ranked outside of the top ten and were not considered during the site selection process. This section contains descriptions of the 10 road segments and images of the segments are provided in Appendix B below.

Figures 5a and 5b: General location of the top 10 road segments in the Bakersfield CBSA.



As shown in the TAD Matrix in Appendix A, road segment evaluations were based on many categories of criteria, however some of the categories were more critical to the decision-making process than others. In addition to meteorological considerations, the most important criteria included road design, road structures, and available space for an air monitoring site. Below are descriptions of the top 10 road segments and the reasons why they were acceptable or unacceptable for site consideration.

3.2.2.1 Segment 1: Bakersfield, California Ave

Segment 1 is located along Freeway 99 from California Avenue northward to Rosedale Freeway (JCT RTE 58). The southern and northern ends of segment are above grade and not acceptable for near-road monitor siting while the middle portion of segment is at grade with obstructions and space limitation issues along the segment. Trees align much of the segment and obstruct the air flow, and the above grade portion of the segment consists of a bridge over a railroad yard and a river. The issues with this segment made it unacceptable for siting a near-road monitor.

3.2.2.2 Segment 2: Bakersfield, Ming Ave

Segment 2 is located along Freeway 99 from Ming Avenue northward to Highway 58 (JCT RTE 58). The entire segment is below grade and characterized by upward slopes on both sides of the Freeway. Additionally, sound walls line the top of the slopes, and the interchange area is covered with mixed vegetation and trees. These characteristics of this segment made it unacceptable for siting a near-road monitor.

3.2.2.3 Segment 3: JCT RTE 58 East

Segment 3 is located along Freeway 99 from Highway 58 (JCT RTE 58) northward to California Avenue. The entire segment is below grade and both sides of the Freeway characterized by upward slopes with trees and ground vegetation on them. Additionally, sound walls line the top of the slopes on the west side of the freeway. These characteristics of this segment made it unacceptable for siting a near-road monitor.

3.2.2.4 Segment 4: Bakersfield, White Lane

Segment 4 is located along Freeway 99 from White Lane northward to Ming Avenue. The southern end of segment is at grade with sound wall limiting space on the east side of the freeway. The remainder of segment is below grade characterized by upward slopes on both sides of the freeway. Trees align most of the segment causing space limitation and air flow obstruction issues. These characteristics of this segment made it unacceptable for siting a near-road monitor.

3.2.2.5 Segment 5: Buck Owens Blvd

Segment 5 is located along Freeway 99 from Rosedale Freeway northward to Airport Drive. The central and southern sections of segment are above grade and serve as an overpass so there are no areas to consider along this stretch of the segment. The northern end of the segment is at grade but parcels that appear acceptable are too close to the slope of the above grade portion of the segment. Additionally, trees and bushes present space limitations and air flow obstructions along the remainder of the at grade portion of the segment. The issues with this segment made it unacceptable for siting a near-road monitor.

3.2.2.6 Segment 6: JCT RTE 204 / Airport Drive

Segment 6 is located along Freeway 99 from Airport Drive northward to Route 204. The southern tip of the segment is slightly above grade due to a small downward slope from the Freeway shoulder to the adjacent frontage road on the east side of the Freeway. The segment then levels to at grade until upward sloping of an overpass at the northern end of the segment creates a below grade area. Trees, bushes, and shrubs align much of the segment causing space limitations and air flow obstruction. The characteristics of this segment made it unacceptable for siting a near-road monitor.

3.2.2.7 Segment 7: Panama Lane

Segment 7 is located along Freeway 99 from Panama Lane northward to White Lane. Figure 6 shows concentric circles depicting 100, 400, and 1,000 meters radii around the parcels in the segment. The 100 meter circle is the maximum extent of a microscale site. These concentric circles show the land uses around the parcels. Any of the parcels adjacent to these would have similar characteristics.

The southern end and the center section of the segment are at grade and the northern end of the segment is above grade. With the exception of southern and northern tips of the segment, a sound wall and trees align the east side of the segment and pose space limitations. On the west side of the segment space intermittent trees along the segment and a sound wall aligning the southern tip of the segment prior to the off-ramp are the only space limitations. The District identified several parcels adequate for building a monitoring station however they were on the wrong side of the freeway with regard to the prevailing wind direction (see sample site in Figure 6). The space limitations and the prevailing wind issue make the segment unacceptable for siting a near-road monitor.

Figure 6: A sample site in Segment 7 that was not pursued because it was on the windward side of the freeway.

The image in Figure 6 shows the other area that the District investigated in some detail. This area is on the west side of the freeway. The meteorological analysis ruled this site out because of the westerly winds. Starting from the north, the east side of the freeway is elevated and gradually comes down to the ground level where a sound wall starts. The sound wall continues all the way to the shopping center. The shopping center is too close to the freeway on-ramp to have a site placed there and they have planted trees along their fence line. Nearly the entire section of the west side of the freeway has space for an air monitoring station, initial contact with these landowners was made and the meteorological analysis removed them from consideration.

3.2.2.8 Segment 8: JCT. RTE. 99 North

Segment 8 is located along Interstate 5 from the Interstate 5 – Freeway 99 JCT northwestward to Maricopa Freeway 166. The road is above grade on the interchange then descends to at-grade for remainder of segment to Maricopa Freeway 166. There are no roadside structures or space limitations along the segment. However, the surrounding land use is agricultural farming so property and not in an urban area. The District removed this segment from consideration because of the lack of population in the area. Given the relatively low population exposure in this rural segment, this segment may not be representative of near-road exposure levels that occur in more urban areas with higher populations in the Bakersfield CBSA.

3.2.2.9 Segment 9: Oil Junction

Segment 9 is located along Freeway 99 from Norris Road northward to JCT Freeway 65. The southern end of segment is above grade then descends to at grade for remainder of segment. While there are some space limitations along the segment, the District identified a few parcels in the central portion of the segment that are acceptable for near-road monitor placement.

3.2.2.10 Segment 10: Olive Drive

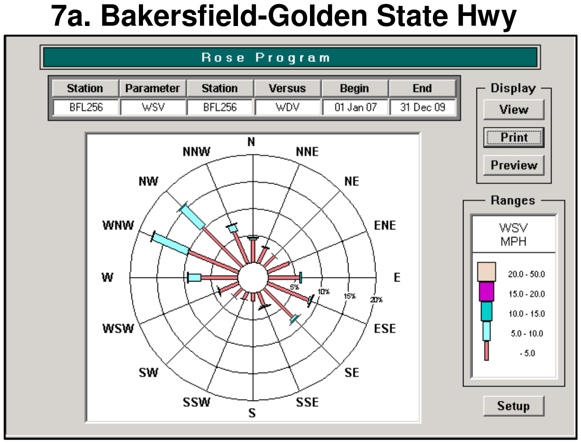
Segment 10 is located along Freeway 99 from Olive Drive northward to Norris Rd. The segment is at grade with intermittent trees and bushes aligning the segment. Space limitations are minimal however the frontage road adjacent to the freeway and the parcels and businesses located on the frontage road present accessibility issues which make the segment unacceptable for siting a near-road monitor.

3.3 Meteorological Considerations

As shown in the wind roses below, local winds in Bakersfield and along Interstate 5 blow primarily from the northwest to the southeast. The Freeway 99 corridor runs through the city of Bakersfield in a north-south orientation. Interstate 5 runs from northwest to southeast along the west side of the Valley to the Freeway 99 interchange located south of Bakersfield. Given that the prevailing winds have a westerly component to them, the District determined that locations on the east side of Freeway 99 and Interstate 5 were the most appropriate for near-road monitor placement and focused our efforts only on the east side of the freeway once the District made this determination. Air pollution from the freeway and the interstate would generally blow away from any monitor located on the west side of the freeway and interstate.

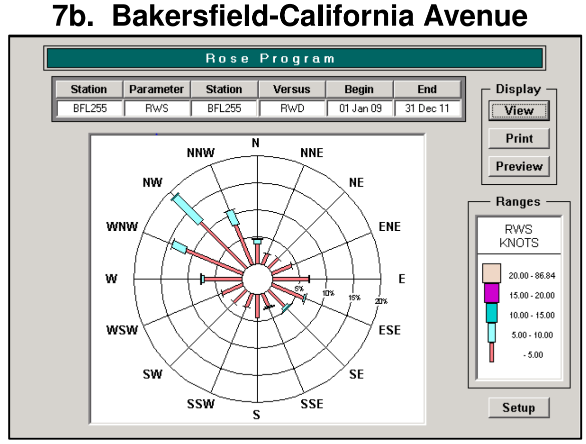
Figures 7a through 7c: Wind Roses

7a. Bakersfield-Golden State Hwy



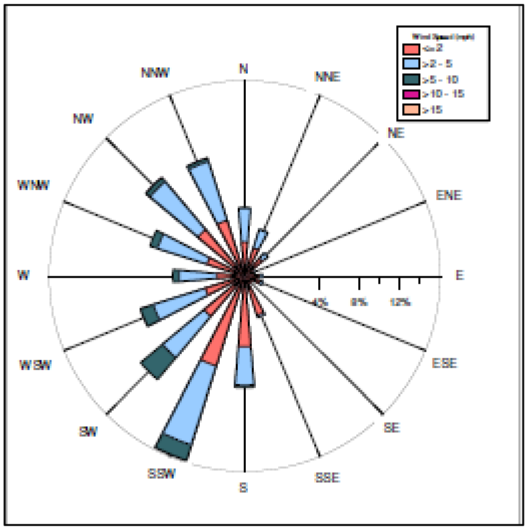
Source: District EMC Data Program

7b. Bakersfield-California Avenue



Source: District EMC Data Program

7c. Mettler Station AU491



Source: University of Utah Meso West
http://mesowest.utah.edu/cgi-bin/droman/download_ndb.cgi?stn=KSLC

3.4 Terrain through Bakersfield CBSA

The terrain through Bakersfield CBSA is generally flat couple of bluffs caused by rivers. The Freeway 99 is generally at grade at the northern and southern limits of the city of Bakersfield and either elevated or below grade in the urban area of city. The Interstate 5 segment is flat with farm fields on either side. There are sloughs and other low areas along this part of Interstate 5. Figure 8a shows a satellite image of the area under consideration in the city of Bakersfield and Figure 8b shows a satellite image of the terrain of the Interstate 5 segment.

Figure 8a: Map of the Bakersfield Metropolitan Area

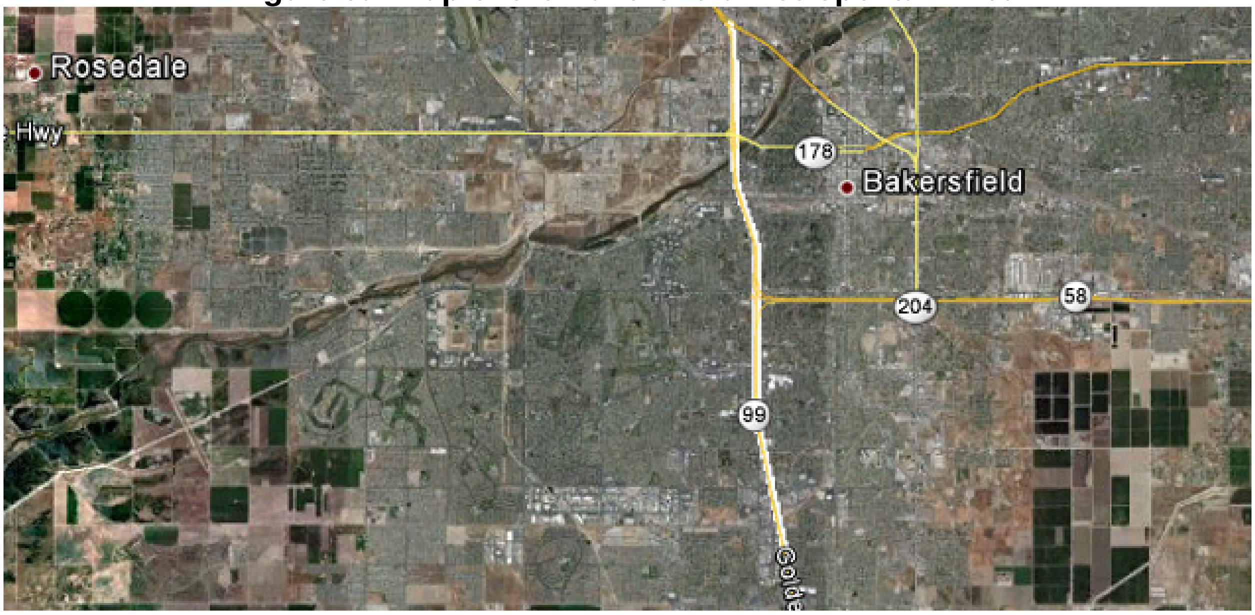
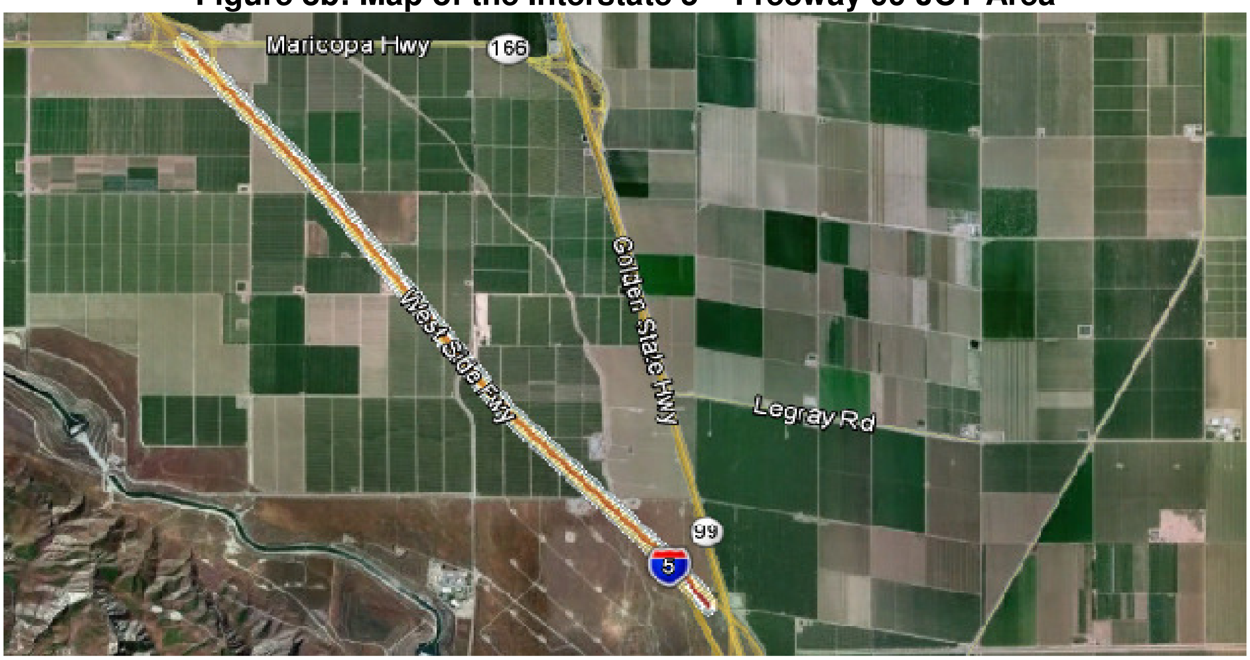


Figure 8b: Map of the Interstate 5 – Freeway 99 JCT Area



3.5 Spatial scales and population exposure

As stated above, NO_2 near-road sites are intended to be microscale sites. This means that these sites measure representative concentrations within 100 meters. Representative concentrations measured over areas greater than this do not fit the definition of a microscale site. The TAD states that the highest concentrations can be found within 20 meters of the freeway, so the District focused efforts on locations that can handle an air monitoring site within 20 meters. Additionally, the required range for the station's probe height is 2 to 7 meters in order to capture the highest NO_2 concentrations. While the preferred probe height is 2 meters, it will not be possible due to the structure and orientation of the monitoring station so, the District will place the probe as close to the 2 meter height as possible.

As referenced above, population exposure as one of the criteria that should be considered during the site selection if you have multiple acceptable sites in the same road segment. For the Bakersfield CBSA there are only two segments that have potential multiple acceptable sites, segments 7 and 9. Segment 7 sites were eliminated due to wind direction and only one landowner in segment 9 was willing to negotiate a lease with us.

Segment 8 was removed from consideration because it was not in an urban area and there were no population sources nearby. The District believes that people that are living, working, or commuting daily within and adjacent to the Bakersfield metropolitan area will have a more significant exposure than those using the segment of Interstate 5.

Maps showing the locations that the District investigated in some detail are shown in Section 3 and Section 4. The maximum 100 meter radius of a microscale site is shown for reference. The 400 and 1,000 meter radii are shown for informational purposes.

3.6 Correspondence with property owners

The District found 19 acceptable parcels along Freeway 99 so letters of interest were sent to each of the property owners. Nine responses were received, however only seven of the property owners expressed interest. The District then began making direct contact with the seven interested land owners. Upon meeting with the representative of a landowner in Segment 7, the District discovered that the wind direction would be a problem and that lead to the elimination of all locations on the west side of the freeway. This issue left only three potential locations in Segment 9 from which to choose. One of the three potential sites would need extensive changes made to the property in order to accommodate an air monitoring station so that site was deemed infeasible. Of the two remaining potential sites, one of the landowners stopped talks with the District after reading the draft lease, but the other was willing to negotiate a lease so the process was able to move forward.

4.0 Final Site Selection

After everything was considered, the road segment with the 9th highest FE-AADT located at 2809 Unicorn Road was selected. The selected site meets the siting criteria listed in the CFR, and is also acceptable for accommodating placement of a PM2.5 and other air pollution analyzers in the future.

Figure 9 is a map of the final site selection located on Unicorn Road in Segment 9, and. The concentric circles depict 100, 400, and 1,000 meters radii around the parcels in the segment. The 100 meter circle is the maximum extent of a microscale site. These concentric circles show the land uses around the parcels. Any of the parcels adjacent to these would have similar characteristics.

Figure 9: Final Section—2809 Unicorn Road

The image in Figure 9 shows the location the District chose to locate the NO_2 near-road site in Bakersfield CBSA. It is in segment 9 and the landowner is willing to work with the District. It is on the west side of the freeway and is in a light commercial area. There is a subdivision nearby on the east side of the freeway.

Figure 10 below shows a roadside view of the selected site for the NO_2 near-road air monitoring station. The site will be as close to the freeway as practicable. The vacant lot to the right and the adjacent parking lot with the building are on the same parcel.

Figure 10: Selected site located at 2809 Unicorn Road in Segment 9

APPENDICES

Appendix A —Traffic Data Tables

Below is the list of the top 30 segments in the Bakersfield CBSA based on Caltrans data.

Table 1: Kern County Top Road Segments by Fleet Equivalent AADT[5]

Route	Postmile[6]	Description	Ahead AADT[2]	AADT Rank	AADTT[1]	AADTT Rank	Congestion[3]	FE AADT[7]	FE Rank
99	24.599	BAKERSFIELD, CALIFORNIA AVE	132,000	2	28,188	1		385,692	1
99	22.604	BAKERSFIELD, MING AVE	133,000	1	27,720	2	1	382,480	2
99	23.514	JCT. RTE. 58 EAST	129,000	3	23,400	3		339,600	3
99	21.082	BAKERSFIELD, WHITE LANE	114,500	4	17,500	5		272,000	4
99	25.654	JCT. RTE. 58 W, JCT. RTE. 178 E	102,500	5	18,300	4		267,200	5
99	26.776	BUCK OWENS BLVD	102,500	6	15,904	8		245,636	6
99	19.541	PANAMA LANE	92,600	8	16,240	7		238,760	7
5	15.858^	JCT. RTE. 99 NORTH	72,000	11	17,410	6		228,690	8
99	28.556	OIL JUNCTION	78,000	9	14,960	9		212,640	9
99	27.866	OLIVE DRIVE	74,000	10	13,783	11	2	198,047	10
58	53.519	SOUTH CHESTER AVE	72,000	12	13,770	12		195,930	11
58	54.419	SOUTH UNION AVE	71,000	13	13,860	10		195,740	12
99	27.046	JCT RTE 204/AIRPORT DRIVE	102,500	7	10,294	21		195,146	13
58	55.404	COTTONWOOD RD	70,000	14	13,084	13		187,756	14
5	0.000	LOS ANGELES/KERN CO LINE	70,000	15	13,020	14		187,180	15
58	53.387	H ST	70,000	16	11,750	15		175,750	16
58	52.360	BAKERSFIELD, S. JCT RTE 99	68,000	20	11,487	16		171,383	17
5	5.020	FORT TEJON/DIGIER RD	69,000	17	11,250	17		170,250	18
5	13.523	WHEELER RIDGE RD	69,000	18	11,000	18		168,000	19
5	1.612	LEBEC RD	69,000	19	10,890	20		167,010	20
178	2.009	BAKERSFIELD, JCT. RTE. 204	67,000	21	10,962	19		165,658	21
99	17.500	JCT. RTE. 119 WEST	66,500	22	10,500	*		161,000	22

Table 1: Kern County Top Road Segments by Fleet Equivalent AADT[5] (continued)

178	0.360	BAKERSFIELD, OAK ST	62,000	24	10,002	22		152,018	23
99	29.878	JCT. RTE. 65	61,000	25	9,723	23		148,507	24
99	30.532	SEVENTH STANDARD RD	62,500	23	9,000	*		143,500	25
58	56.410	MT. VERNON AVE	60,000	26	8,473	24		136,257	26
178	3.402	BAKERSFIELD, BEALE AVE	56,000	28	7,280	25		121,520	27
99	52.450	POND RD	53,000	29	6,891	26		115,019	28
99	50.410	MC FARLAND, ELMO HWY	53,000	30	6,749	27		113,741	29
99	36.523	CAWELO, LERDO FREEWAY	59,500	27	6,000	*		113,500	30
178	0.000	JCT. RTES. 99/58	52,000	31	6,640	28		111,760	31

[1] Road segments with no Truck AADT (AADTT) are given substitution with the following:
Route 99:

- PM 17.500 using 2/3 of adjacent segment Panama's value = value of 10,500
- PM 30.532 using JCT. RTE. 65, the segment had similar AADTT and was estimated at 9,000
- PM 36.523 using JCT. RTE. 65, the segment had a large estimated exit volume of 6,000 at Lerdo Hwy

[2] The Total AADT numbers shown apply to the freeway immediately ahead of the postmile.

[3] Congestion is in annual vehicle delay in thousand hours. Caltrans District 6 (which includes Kern County) has less than 2% of the statewide annual vehicle hours of delay.

[4] PM 15.858 - Data for AADT was double counting the adjacent road segment. Caltrans has determined that the data is erroneous for this location and requested that the District use 2009 data. The annual traffic volume data shows that state freeway traffic decreased 0.2% in 2010 from 2009.

[5] The Annual Average Daily Traffic (AADT) is defined as the total volume for the year divided by 365 days. Very few locations in California are actually counted continuously. Traffic counting is generally performed by electronic counting instruments that are moved from location to location throughout the State in a program of continuous traffic count sampling. The resulting counts are adjusted to an estimate of annual average daily traffic by compensating for seasonal influence, weekly variation and other variables which may be present. All traffic volume figures listed include traffic in both directions.

[6] Postmile - Each breakpoint is identified by the postmile value corresponding to that point on the freeway. The postmile values increase from the beginning of a route within a county to the next county line. The postmile values start over again at each county line. Postmile values usually increase from South to North or West to East depending upon the general direction the route follows within the state.

[7] The equation FE AADT = (Ahead AADT-AADTT)+(AADTT*10) is defined in the TAD: http://www.epa.gov/ttn/amtic/nearroad.html

Data source:
Caltrans - All Vehicle http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/2010all/2010_Traffic_Volumes.pdf
Caltrans - Truck Data http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/truck2010final.pdf
Caltrans - Congestion http://www.dot.ca.gov/hq/traffops/sysmgtpl/MPR/pdfs/MPR2009.pdf
Data accuracy of Caltrans AADT for 100,000 vehicles is approximately ± 6%

Appendix B—Site Details

Below are the site details for the selected site and the site that was ruled out because of meteorology.

Table 2: Site Details Matrix

Site/Segment Parameter	Segment 7 Car Dealership	Segment 9 2809 Unicorn Rd
Road segment name	Segment 7	Segment 7
Road segment end points	Panama Lane to White Lane	Norris Rd to JCT Hwy 65
Road type	Freeway	Freeway
Interchanges	None	None
Frontage roads	None	None
Roadside design	At grade	At grade
Terrain	Flat	Flat
Current road construction	None	None
Future road construction	Not aware of any	Not aware of any
Roadside structures	None	None
AADT	95,600	78,000
HD counts	16,240	14,960
FE-AADT	238,760	212,640
Congestion information	No congestion	No congestion
Infrastructure	At the street	At the Street
Surrounding land use	Light Commercial/Industrial	Light Commercial
Nearby sources	Freeway	Freeway
Meteorology	Unacceptable	Acceptable
Population exposure	Only parcel in segment	Only parcel in segment
Available space – site footprint	1000 square feet	1000 square feet
Safety features	None	Will need to be installed
Property type	Private Property	Private Property
Property owner	Not Applicable	
Likelihood of access	Easy access	Easy access
Other details/local knowledge	Landowner willing to work with us	Landowner willing to work with us

Appendix C—Maps of Segments

Beginning on the following page, aerial maps show the top 10 segments, their end points in detail, and the surrounding land use of each segment.

Segment 1

This segment is located along Freeway 99 from California Avenue northward to Rosedale Freeway (JCT RTE 58).

Source: Google Earth

Segment 2

This segment is located along Freeway 99 from Ming Avenue northward to Highway 58 (JCT RTE 58).

Source: Google Earth

Segment 3

This segment is located along Freeway 99 from Highway 58 (JCT RTE 58) northward to California Avenue.

Source: Google Earth

Segment 4

This segment 4 is located along Freeway 99 from White Lane northward to Ming Avenue.

Source: Google Earth

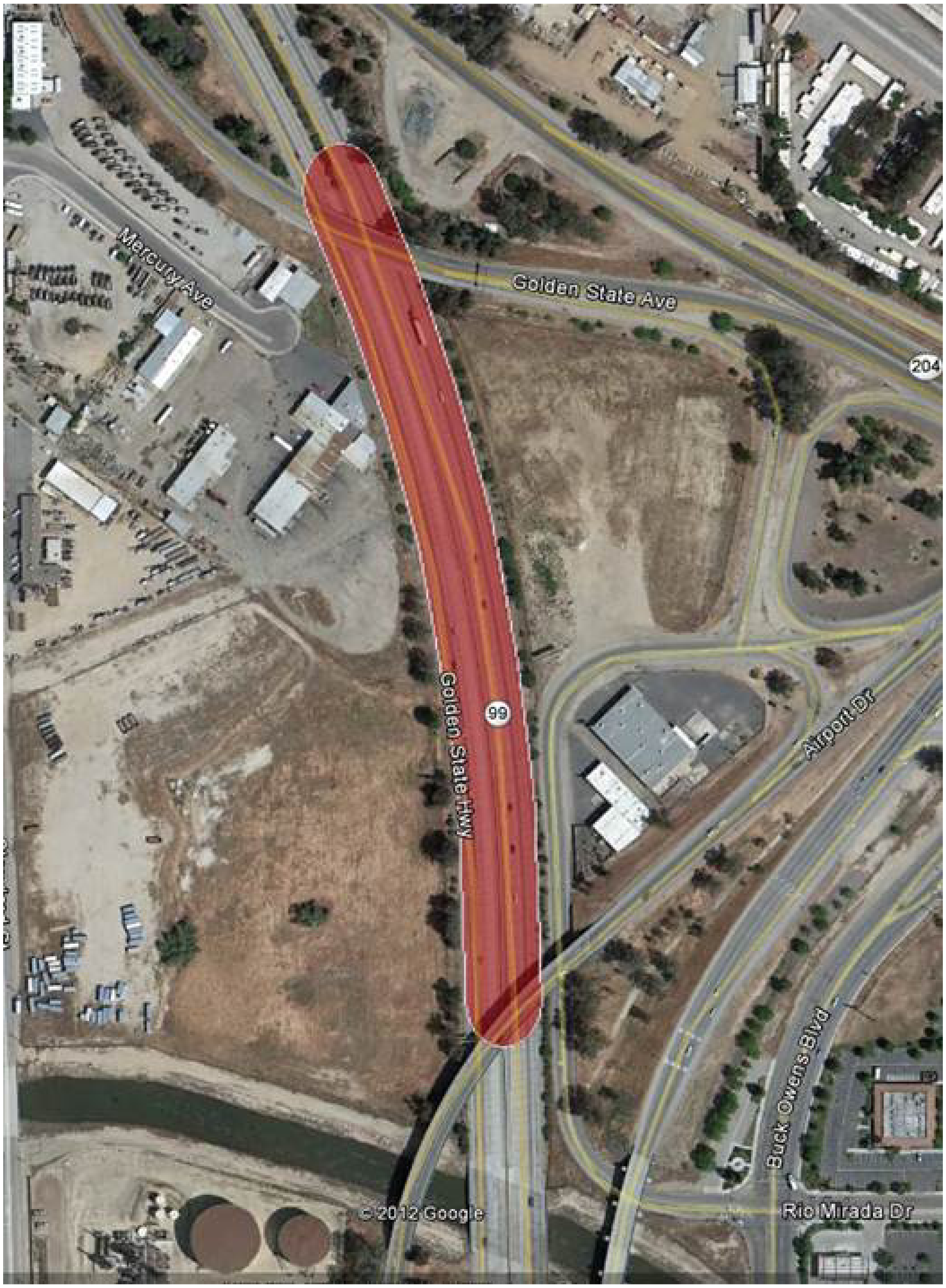
Segment 5

This segment is located along Freeway 99 from Rosedale Freeway northward to Airport Drive.

Source: Google Earth

Segment 6

This segment is located along Freeway 99 from Airport Drive northward to Route 204.



Source: Google Earth

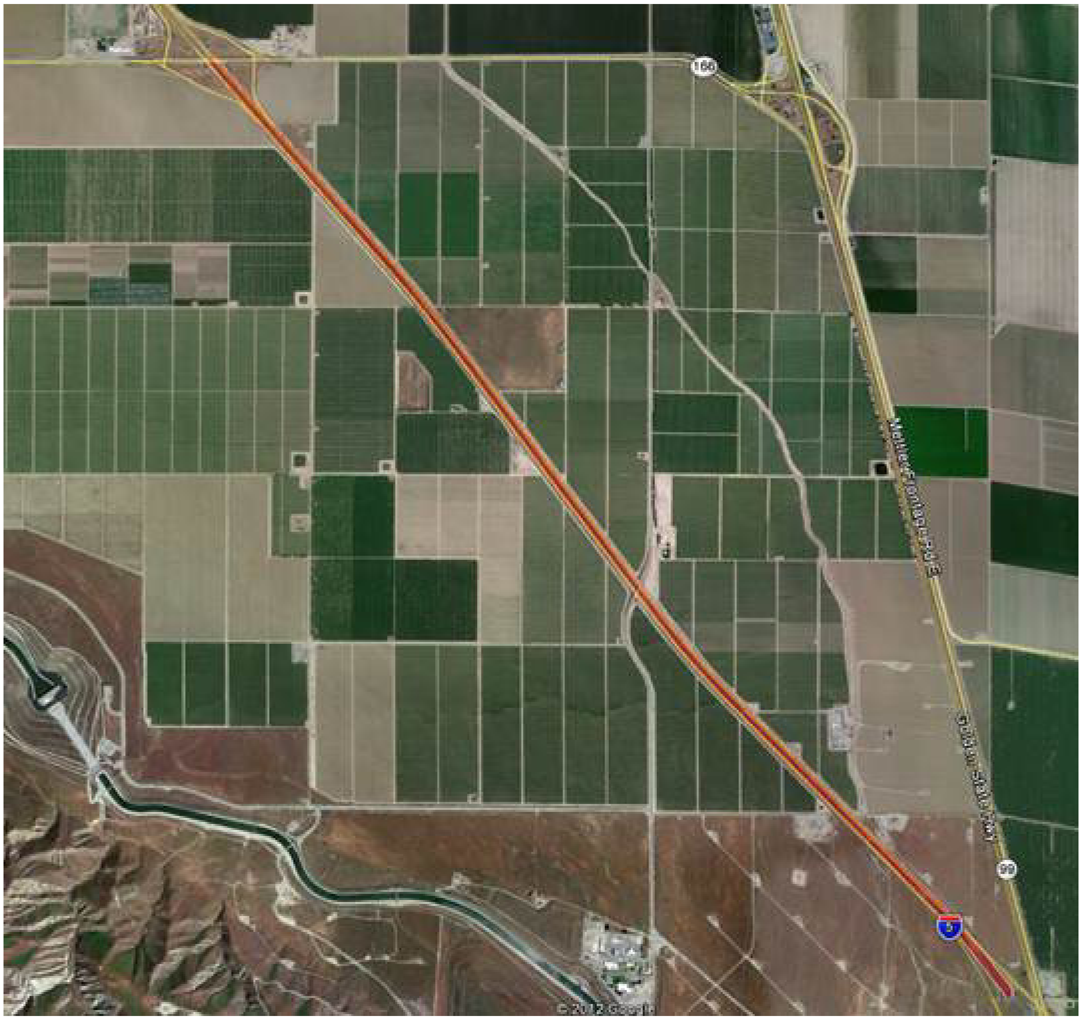
Segment 7

Segment 7 is located along Freeway 99 from Panama Lane northward to White Lane.

Source: Google Earth

Segment 8

Segment 8 is located along Interstate 5 from the Interstate 5 – Freeway 99 JCT northwestward to Maricopa Freeway 166.



Source: Google Earth

Segment 9

This segment is located along Freeway 99 from Norris Road northward to JCT Freeway 65.

Source: Google Earth

Segment 10

This segment is located along Freeway 99 from Olive Drive northward to Norris Rd.

Source: Google Earth